

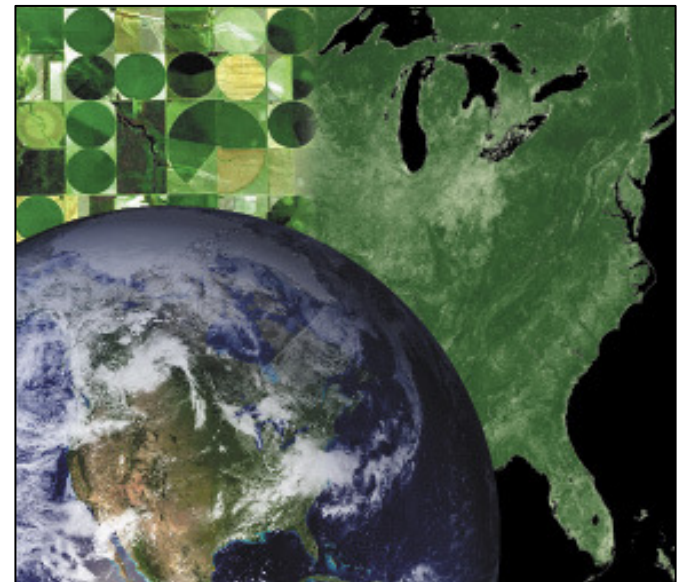
LP DAAC UWG Annual Meeting 2010

New Missions

August 11-12, 2010
USGS/EROS, Sioux Falls, SD

Kevin Gallo
LP DAAC UWG Chair

Dave Meyer
EOS Project Scientist

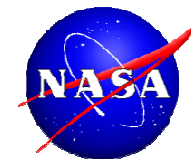


Discussion: New Missions

UWG “is responsible for providing **consultation and recommendations** covering a broad range of topics related to the LP DAAC **systems, services, and capabilities.**”

“..is responsible for **representing** the interests of the **land remote sensing community** in this process.”

LP DAAC UWG Charter



Discussion: New Missions

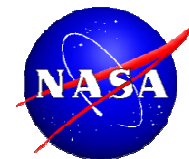
Summary of LP DAAC UWG Action Items/Recommendations from UWG meeting of 13–14 August 2008 (*includes items from Brainstorming Activities*)

Actions (& leads) (*below actions are not prioritized*)

- Clarify disposition of Landsat Level 1T processed data (DAAC)
- Schedule update on status/plans for NLIP at next UWG meeting (DAAC)
- Clarify strategy for deletion of MODIS v4 data and provide to UWG (DAAC)
- Facilitate Landsat and ASTER machine-to-machine gateway for data access (similar to MODIS) (DAAC)



- Provide DAAC/NASA recommendations on potential data sets for inclusion in DAAC (e.g., [eMODIS](#), VIIRS-land, Decadal Survey) (UWG)



Discussion: New Missions

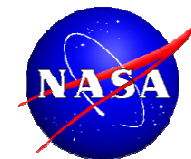
LP DAAC UWG Mid-year Teleconference
April 17, 2009

Other Datasets

- *Provide DAAC/NASA recommendations on potential data sets for inclusion in DAAC (e.g., eMODIS, VIIRS-land, Decadal Survey) (UWG) (from UWG actions/recommendations)*

Seeking UWG members interested in contributing to a white paper. Anticipate brief discussion of potential data set, and justification for LP DAAC as source of data (or enhanced data products, tools, etc.)

Might also include enhancements to existing products, e.g., seamless ASTER N. Amr ASTER Land Sfc Emiss. Database.



Discussion: New Missions



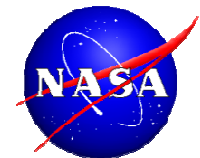
New Missions/Datasets

LP DAAC UWG Annual Meeting
August 5-6, 2009

Kevin Gallo
LP DAAC UWG Chair



U.S. Department of the Interior
U.S. Geological Survey



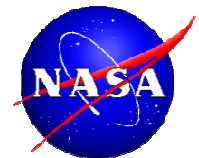
Discussion: New Missions



New Missions/Data Sets and the LP DAAC

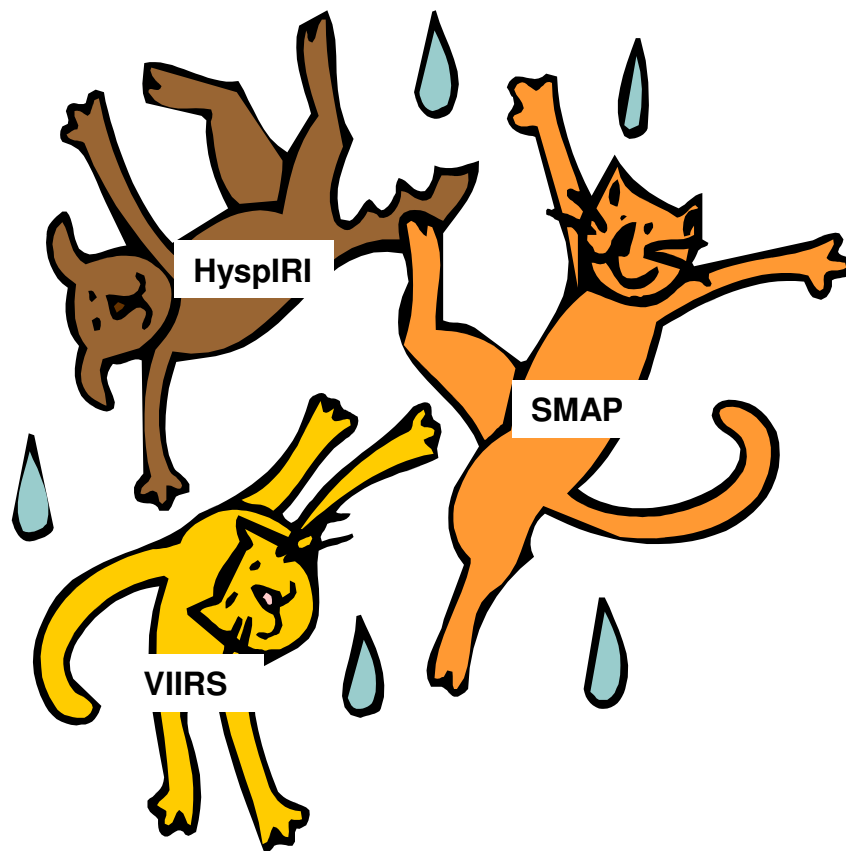
LP DAAC UWG mid-year telecon
April 1, 2010

Kevin Gallo (LP DAAC UWG chair)
Dave Meyer (EOS Project Scientist)



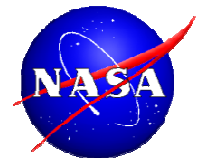
Discussion: New Missions

Finalizing topic
seems like “herding
cats.”



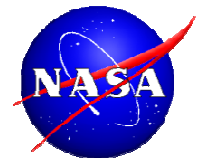
Discussion: New Missions

Time to complete
this topic.



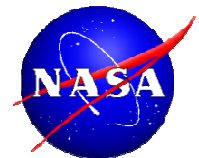
New Missions – Considerations

- The UWG has been requested to provide input related to [New Missions/Data](#) to LP DAAC management in the form of a White Paper. This White Paper offers the UWG a terrific opportunity to represent the interests of the land user-community and play a critical [role in the decision process related to future mission data that resides in or is accessible from the LP DAAC.](#)



New Missions – Considerations

- NASA and USGS are very interested in the UWG input on this topic. The White Paper will be forwarded to the NASA LP DAAC Program Scientist for consideration of the recommendations.



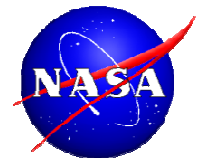
New Missions – Considerations

- What data will you or your successors in land science community want to use for future research/applications?
- Please consider the relevancy of the New Missions to the Land Science Community (and LP DAAC) based on criteria listed in table at end of slides.
- This is an assessment of the importance these future missions and data might have among the Land Science Community, not a recommendation for or against data archival or distribution from the LP DAAC.




New Missions - Instructions

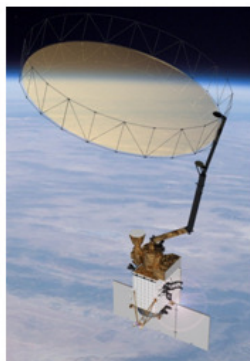
- Please review the following New Missions and complete the table on the last slide (**and separate spreadsheet**) related to these missions, or additional New Missions you may add to the table, prior to the UWG meeting next week.
- We plan to finalize this table at the UWG meeting and incorporate the table and informational material included in this presentation into the White Paper for submission to LP DAAC management.



New Missions - Instructions

UWG members have received “Homework Assignment” with general information on anticipated New Missions.

Soil Moisture Active-Passive (SMAP)	
<h3>Primary Science Objectives</h3> <ul style="list-style-type: none">• Global, high-resolution mapping of soil moisture and its freeze/thaw state to:<ul style="list-style-type: none">– <i>Link terrestrial water, energy and carbon cycle processes</i>– <i>Estimate global water and energy fluxes at the land surface</i>– <i>Quantify net carbon flux in boreal landscapes</i>– <i>Extend weather and climate forecast skill</i>– <i>Develop improved flood and drought prediction capability</i>	<div></div> <h3>Architecture</h3> <ul style="list-style-type: none">• <i>L-band radiometer for high accuracy</i>• <i>L-band radar for high resolution; freeze-thaw detect</i>• <i>Common 6m antenna spins at 15 rpm to provide global coverage every 3 days</i>• <i>Merged radiometer & radar data yield high accuracy, high resolution soil moisture product</i>• <i>680 km polar sun-synchronous orbit</i>• <i>3 year mission life</i>
<h3>Development Status</h3> <ul style="list-style-type: none">• SMAP entered Phase A in September 2008• Science Definition Team selected; initial SDT meeting held in Nov 2008• Successfully completed MDR/SRR/PNAR in February 2009• Transition into Phase B expected in October 2009 (pending funding profile resolution)	<h3>Mission Implementation Challenges</h3> <ul style="list-style-type: none">• <i>L-band measurements in increasingly congested terrestrial RFI environment</i>• <i>Dynamics and control of 6 m spinning antenna</i>• <i>Resolution of NASA funding profile for mission</i>
Science Data Systems in the Decadal Survey Era Workshop, Jun 25-26, 2009	



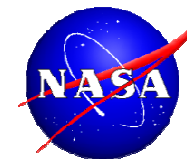
New Missions - Instructions

Time to complete table that rates New Missions for relevance to Land Science community (also provided with “Homework” to UWG members prior to this meeting).

[illegible]

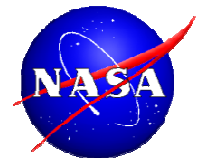
New Missions – Survey Results

New Mission/Data Assessment for land remote sensing community														
		Missions/Sensors												
		VIIRS	SMAP	ICE Sat-II	DESDynI	HyspIRI	GEO-CAPE	Glory	SWOT	CLARREO	LIST	ESA/Sentinel	Landsat-8	others
Anticipated Launch		2011	2013	2015	2017	2013-16	2013-16	2010	2020	2017		2012	2012	
Evaluation Criteria														
Scientifically Relevant		1	2	2.1	1	1	3.5	3.6	2.2	3.4		1.5	1	
Accessibility		1	1.9	1.6	1.3	1	3.7	3.6	2.2	3.4		1.5	1	
Level of Service		1.1	2	1.9	1.4	1	3.7	3.8	2.2	3.6		2.2	1	
Long-term Preservation		1.1	2.5	2.2	1.4	1	3.7	3.8	2.6	3.8		2.6	1	
Level of Priority														
High Level	1	1.9 - 1.0												
Moderate	2	2.9 - 2.0												
Low	3	3.9 - 3.0												
None	4	4.9 - 4.0												
Need Addn. Information	5													



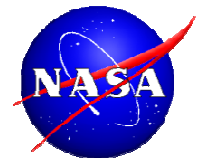
New Missions – Survey Results

- Comments: 1) Level of priority, in the present, could be influenced by scheduled launch date. SWOT now has 2020 date. Some others are much closer.
- 2) Priority for land science community of some missions depends heavily on level of support (e.g. for ICESAT data to be useful outside the ice community...its processing and distribution should address this goal).



New Missions – Survey Results

Next Step



New Missions - Instructions

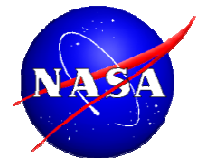
White Paper

on

Assessment of New Missions/Data
relevant to Land Sciences Community

prepared for the Land Processes DAAC

by the LP DAAC User Working Group



New Missions - Instructions

Introduction

|
Background

New Missions

VIIRS

SMAP

ICE SATII

DESDyni

HyspIRI

GEO-CAPE

Glory

SWOT

CLARREO

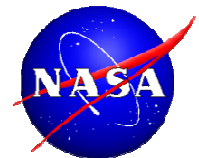
LIST

ESA/Sentinel

Landsat-8

Other

Summary/Conclusions



New Missions - Instructions

Introduction

|
Background

New Missions

VIIRS

SMAP

ICE SATII

DESDyni

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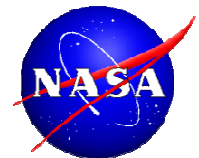
~~LIST~~

ESA/Sentinel

Landsat-8

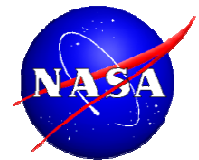
Other

Summary/Conclusions




New Missions - Instructions

For each New Mission relevant to LP
DAAC will prepare following
documentation.....I




New Missions - Instructions

VIIRS



Mission Objective: The Visible/Infrared Imager/Radiometer Suite collects visible/infrared imagery and radiometric data. Data types include atmospheric, clouds, earth radiation budget, clear-air land/water surfaces, Primary instrument for satisfying 22 environmental data records (EDRs).

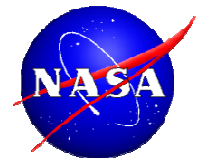
Anticipated Launch: 2011



Assessment of VIIRS data to Land Sciences Community
VIIRS is the follow-on sensor to the AVHRR and MODIS. Both of these sensors provided valuable data for the land science community. Continuity of data products from AVHRR and MODIS is critical for the land science community.

Evaluation Summary

- Scientifically Relevant
 - High: frequent use in operations/research
- Accessibility
 - High: direct access or highly visible link
- Level of Service
 - High: fully supported by LP DAAC customer service
- Long Term Accessibility
 - High: primary archive/distributor of data



New Missions - Instructions

VIIRS

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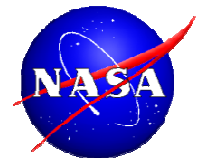
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Gallo and Meyer

UWG, etc.
(*TODAY!*)

Results of
homework



New Missions - Instructions

VIIRS

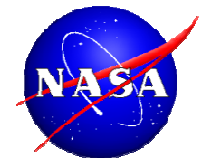
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Evaluation Summary

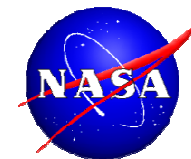
	VIIRS	Level of Priority	
Anticipated Launch	2011	High Level	1
<u>Evaluation Criteria</u>		Moderate	2
Scientifically Relevant		Low	3
Accessibility		None	4
Level of Service		Need Addn. Information	5
Long-term Preservation			



New Missions - Instructions

Assessment of VIIRS data to Land Sciences Community

VIIRS is the follow-on sensor to the AVHRR and MODIS. Both of these sensors provided valuable data for the land science community. Continuity of data products from AVHRR and MODIS is critical for the land science community. For example: NDVI, LST, water vapor, SR, albedo, fire, lai/fpar, (reference MODIS web page/products)

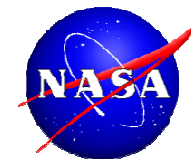


New Missions - Instructions

Assessment of **SMAP data to Land Sciences Community**

SMAP is (copy boilerplate from VIIRs). EX: soil moisture (ag), freeze/thaw (boreal, ag), ET. Carbon cycle component (growing season). (Higher res than previous missions)

critical for the land science community.
rational for lower priority – narrow list of tasks,
not demonstrated capability, not continuity
mission.

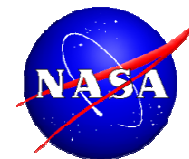


New Missions - Instructions

Assessment of **ICE Sat-II** data to Land Sciences Community

ICE Sat-II is (boilerplate), canopy structure, biomass, topography? (profiler), carbon studies, ecosystem characteristics, (what about icebridge?),

(current icesat— potential exists for derived product services for LP DAAC community)

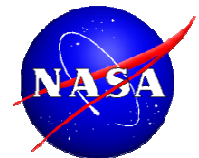


New Missions - Instructions

Assessment of **DESDyni** data to Land Sciences Community

DESDyni is (topography, deformation, vegetation canopy structure, biomass)

critical for the land science community.

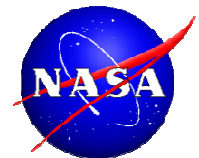


New Missions - Instructions

Assessment of **HyspIRI data to Land Sciences Community**

HyspIRI is (refer to HyspIRI workshop recommendations)

critical for the land science community.

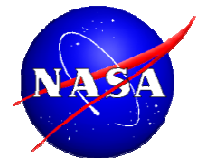


New Missions - Instructions

Assessment of **SWOT** data to Land Sciences Community

SWOT is (surface water, topography, altimetry, lakes/reservoir water storage, river discharge, flow rates, slope, water surface slope retrieval)

critical for the land science community.

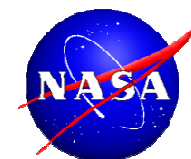


New Missions - Instructions

Assessment of ESA/Sentinel data to Land Sciences Community

ESA/Sentinel-3 is (MERIS – MODIS-like suite of Land products)

Sentinel-2 (SPOT-like, more spectral bands)
(need more specifics on mission instruments, complements VIIRS from a.m. orbit, consider as follow-on to AVHRR)

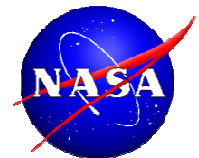


New Missions - Instructions

Assessment of Landsat-8 data to Land Sciences Community

Landsat-8 is (we can fill in)

critical for the land science community.

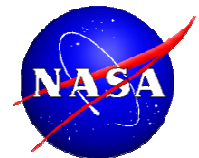


New Missions - Instructions

Assessment of **Other?** data to Land Sciences Community

Other? is (ENMAP, Prism, resource-sat, Mike A. has list, GCOM?)

critical for the land science community.



New Missions - Instructions

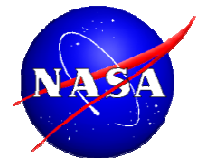
Scientifically Relevant

High: frequent use in operations/research

Medium: moderate use “ ‘

Low: minimal use “ “

None: no use “ “



New Missions - Instructions

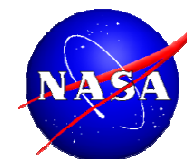
Accessibility ([needs clarification](#))

High: direct access or highly visible link, LP
DAAC unique tools

Medium: direct access or moderately visible link,
no DAAC unique tools

Low: link somewhere within LP DAAC web page

None: no link needed



New Missions - Instructions

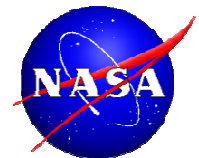
Level of Service

High: fully supported by LP DAAC customer service

Medium: moderate support “ “

Low: minimal support “ “

None: route to appropriate DAAC for support



New Missions - Instructions

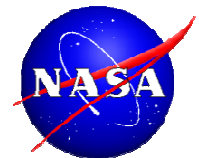
Long Term Accessibility

High: primary archive/distributor of data

Medium: secondary archive, includes
locally produced products

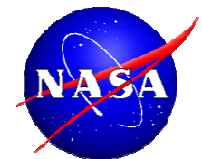
Low: little on-site archive

None: none on-site



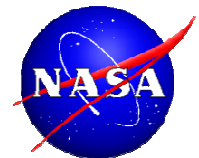
Standing Recommendations

M.1	UWG would like clarification from USGS HQ about the role of LP DAAC within VIIRS era in order to represent current land product constituents.	new missions	UWG letter to USGS
M.2	LP DAAC should monitor land satellite future plans. The UWG believes that coherent plan is needed for continuity into and beyond the Decadal Survey era to avoid the disruptions currently being experienced by the Land Science community.	new missions	We do monitor, but mission planning is out-of-scope for LP DAAC
M.3	Promote mission design that preserves a continuous flow of archived data, such as building two instruments at once.	new missions	out-of-scope for LP DAAC



Discussion: New Missions

Backup Slides



NPP/JPSS VIIRS

Visible/Infrared Imager/Radiometer Suite

The Visible/Infrared Imager/Radiometer Suite collects visible/infrared imagery and radiometric data. Data types include atmospheric, clouds, earth radiation budget, clear-air land/water surfaces, sea surface temperature, ocean color, and low light visible imagery. Primary instrument for satisfying 22 environmental data records (EDRs).

VIIRS Engineering Design Unit (EDU)



Specifications

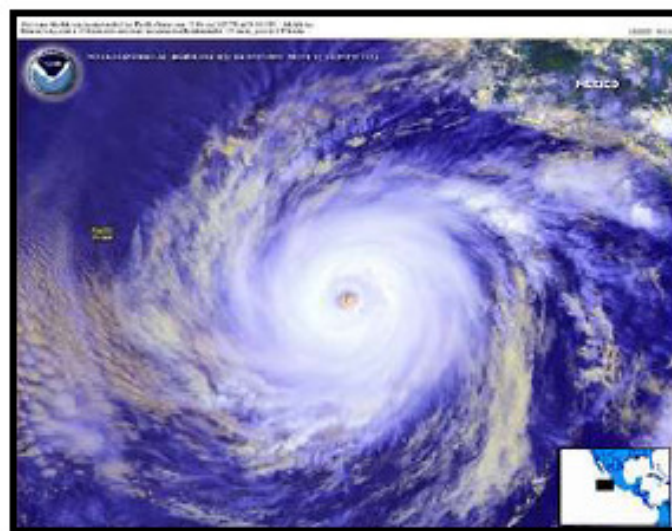
Multiple VIS and IR channels between 0.3 and 14 microns
Imagery Spatial Resolution: ~400m @ NADIR / 800m @ EOS

Heritage


- POES - Advanced Very High Resolution Radiometer (AVHRR/3)
- DMSP - Operational Linescan System (OLS)
- EOS - Moderate Resolution Imaging Spectroradiometer (MODIS)
- NPP - Early validation of operational instrument and algorithms

VIIRS Sensor Bands

	Band No.	Wave-length (µm)	Horiz Sample Interval (km Downtrack x Cross-track)		Driving EDRs	Radiance Range	Ltp or Typ
			Nadir	End of Scan			
Visible/IR Channels	M1	0.412	0.742 x 0.259	1.80 x 1.58	Ocean Color	Low	44.9
	M2	0.445	0.742 x 0.259	1.80 x 1.58	Aerosols	High	155
	M3	0.468	0.742 x 0.259	1.80 x 1.58	Ocean Color	Low	40
	M4	0.555	0.742 x 0.259	1.80 x 1.58	Aerosols	High	146
	M5	0.642	0.371 x 0.587	0.80 x 0.799	Ocean Color	Low	32
	M6	0.675	0.742 x 0.259	1.80 x 1.58	Aerosols	High	123
	M7	0.748	0.742 x 0.259	1.80 x 1.58	Ocean Color	Low	21
	M8	0.865	0.371 x 0.587	0.80 x 0.799	Aerosols	High	90
	M9	0.865	0.742 x 0.259	1.80 x 1.58	Atmospheric CO2	Single	22
	M10	0.865	0.371 x 0.587	0.80 x 0.799	Atmospheric CO2	Single	22
SWIR/IR Channels	M11	1.24	0.742 x 0.259	1.80 x 1.58	Ocean Color	Low	15
	M12	1.378	0.742 x 0.259	1.80 x 1.58	Aerosols	High	88
	M13	1.61	0.371 x 0.587	0.80 x 0.799	Atmospheric CO2	Single	22
	M14	2.13	0.742 x 0.259	1.80 x 1.58	Atmospheric CO2	Single	22
	M15	3.74	0.371 x 0.587	0.80 x 0.799	Atmospheric CO2	Single	22
	M16	3.74	0.742 x 0.259	1.80 x 1.58	Ocean Color	Low	8.4
	M17	3.74	0.742 x 0.259	1.80 x 1.58	Aerosols	High	33.4
	M18	4.05	0.742 x 0.259	1.80 x 1.58	Imagery	Var.	6.70E-05
	M19	6.55	0.742 x 0.259	1.80 x 1.58	Cloud Particle Size	Single	5.4
	M20	10.755	0.742 x 0.259	1.80 x 1.58	Cloud/Cloud Cover	Single	6
LWR/IR Channels	M21	11.450	0.371 x 0.587	0.80 x 0.799	Binary Snow Map	Single	7.3
	M22	12.013	0.742 x 0.259	1.80 x 1.58	Snow Fraction	Single	7.3
	M23	12.013	0.742 x 0.259	1.80 x 1.58	Clouds	Single	0.12
	M24	12.013	0.742 x 0.259	1.80 x 1.58	Imagery Clouds	Single	275 K



Decadal Survey Missions



NASA Earth Science Decadal Survey Studies

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WHY THE DECADAL SURVEY?

The Decadal Survey will generate consensus recommendations from the Earth and environmental science and the applications communities regarding a systems approach to space-based Earth Science observations.






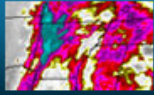


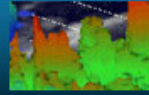
It will encompass the research programs of NASA, NOAA, and associated programs, such as Landsat, a joint initiative of USGS and NASA. [> More](#)

CURRENT

Recent Events

- + ICESat-2 successfully completed KDP-A on December 11, 2009
- + GEO-CAPE Science Working Group Meeting
- + HyspIRI Science Workshop
- + ACE Workshop

PROPOSED MISSIONS

ICESat II 	CLARREO 	SMAP 	DESDynI 	SWOT 
HyspIRI 	ASCENDS 	GEO-CAPE 	ACE 	LIST 
PATH 	GRACE-II 	SCLP 	GACM 	3D-Winds 

RELATED SITES

- + NASA Science : Science Mission Directorate
- + Earth Science Directorate
- + Goddard Space Flight Center
- + Earth Science Projects Division
- + Langley Research Center
- + Langley Science Division
- + Jet Propulsion Laboratory
- + Earth Science & Technology Directorate
- + AMES Research Center
- + AMES Earth Science Division
- + National Oceanic and Atmospheric Administration
- + U.S. Geological Survey
- + NRC Report
- + Earth Science Technology Office (ESTO)

[> More](#)



<http://decadal.gsfc.nasa.gov/index.html>



Decadal Survey Missions

Atmospheric Aerosols & Composition

- + [GEO-CAPE](#) (Coastal and Air Pollution Events)
- + [ACE](#) (Aerosol and cloud profiles for climate and water cycle)
- + [GACM](#) (Global Atmospheric Composition Mission)

Atmospheric Water Cycle

- + [SMAP](#) (Soil Moisture Active-Passive)
- + [ACE](#) (Aerosol/Cloud/Ecosystems)
- + [PATH](#) (Precision and all-weather temperature and humidity)
- + [3D-Winds](#) (Three-Dimensional Tropospheric Winds from Space-based Lidar)

Carbon Cycle

- + [SMAP](#) (Soil Moisture Active-Passive)
- + [ICESat II](#) (Ice, Cloud, and Land Elevation Satellite-II)
- + [DESDynI](#) (Deformation, Ecosystem Structure and Dynamics of Ice)
- + [HyspIRI](#) (Hyperspectral/IR Imagery)
- + [ASCENDS](#) (Active Sensing of CO2 Emissions over Nights, Days, and Seasons)
- + [GEO-CAPE](#) (Geostationary Coastal and Air Pollution Events)
- + [ACE](#) (Aerosol/Cloud/Ecosystems)
- + [LIST](#) (Lidar Surface Topography)

Oceanography

- + [ICESat II](#) (Ice, Cloud, and Land Elevation Satellite-II)
- + [SWOT](#) (Surface Water/Ocean Topography)
- + [ACE](#) (Aerosol/Cloud/Ecosystems)

Polar Climate Change

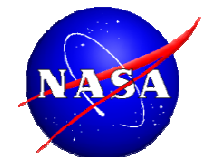
- + [CLARREO](#) (Climate Absolute Radiance and Refractivity Observatory)
- + [ICESat II](#) (Ice, Cloud, and Land Elevation Satellite-II)
- + [DESDynI](#) (Deformation, Ecosystem Structure and Dynamics of Ice)
- + [LIST](#) (Lidar Surface Topography)
- + [GRACE-II](#) (Gravity Recovery and Climate Experiment-II)

Weather and Climate

- + [CLARREO](#) (Climate Absolute Radiance and Refractivity Observatory)

Terrestrial Water Cycle

- + [SMAP](#) (Soil Moisture Active-Passive)
- + [SWOT](#) (Surface Water/Ocean Topography)
- + [ACE](#) (Aerosol/Cloud/Ecosystems)
- + [GRACE-II](#) (Gravity Recovery and Climate Experiment-II)
- + [SCLP](#) (Snow and Cold Land Processes)

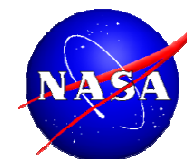


NASA “Tier 1” Missions (launch by 2013)

Mission	Mission Description	Orbit	Instruments
CLARREO (NASA portion)	Solar and Earth radiation: spectrally resolved forcing and response of the climate system	LEO, Precessing	Absolute, spectrally-resolved interferometer
SMAP	Soil moisture and freeze/thaw for weather and water cycle processes	LEO, SSO	L-band radar L-band radiometer
ICE Sat-II	Ice sheet height changes for climate change diagnosis	LEO, Non-SSO	Laser altimeter
DESDynI	Surface and ice sheet deformation for understanding natural hazards and climate; vegetation structure for ecosystem health	LEO, SSO	L-band InSAR Laser altimeter

Primary mission is Land Processes

Secondary mission is Land Processes

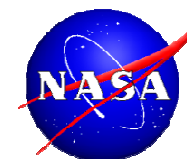


NASA "Tier 2" Missions (Launch 2013-2015)

Mission	Mission Description	Orbit	Instruments
HyspIRI	Land surface composition for agriculture and mineral characterization; vegetation types for ecosystem health	LEO, SSO	Hyperspectral spectrometer
ASCENDS	Day/night, all-latitude, all-season CO₂ column integrals for climate emissions	LEO, SSO	Multifrequency laser
SWOT	Ocean, lake, and river water levels for ocean and inland water dynamics	LEO, SSO	Ka-band wide swath radar C-band radar
GEO-CAPE	Atmospheric gas columns for air quality forecasts; ocean color for coastal ecosystem health and climate emissions	GEO	High and low spatial resolution hyperspectral imagers
ACE	Aerosol and cloud profiles for climate and water cycle; ocean color for open ocean biogeochemistry	LEO, SSO	Backscatter lidar Multiangle polarimeter Doppler radar

Primary mission is Land Processes

Secondary mission is Land Processes

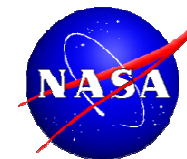


NASA “Tier 3” Missions (Launch after 2015)

Mission	Mission Description	Orbit	Instruments
LIST	Land surface topography for landslide hazards and water runoff	LEO, SSO	Laser altimeter
PATH	High frequency, all-weather temperature and humidity soundings for weather forecasting and SST*	GEO	MW array spectrometer
GRACE-II	High temporal resolution gravity fields for tracking large-scale water movement	LEO, SSO	Microwave or laser ranging system
SCLP	Snow accumulation for fresh water availability	LEO, SSO	Ku and X-band radars K and Ka-band radiometers
GACM	Ozone and related gases for intercontinental air quality and stratospheric ozone layer prediction	LEO, SSO	UV spectrometer IR spectrometer Microwave limb sounder
3D-Winds (Demo)	Tropospheric winds for weather forecasting and pollution transport	LEO, SSO	Doppler lidar

Primary mission is Land Processes

Secondary mission is Land Processes



Soil Moisture Active-Passive (SMAP)

Primary Science Objectives

- Global, high-resolution mapping of soil moisture and its freeze/thaw state to:
 - *Link terrestrial water, energy and carbon cycle processes*
 - *Estimate global water and energy fluxes at the land surface*
 - *Quantify net carbon flux in boreal landscapes*
 - *Extend weather and climate forecast skill*
 - *Develop improved flood and drought prediction capability*

Development Status

- SMAP entered Phase A in September 2008
- Science Definition Team selected; initial SDT meeting held in Nov 2008
- Successfully completed MDR/SRR/PNAR in February 2009
- Transition into Phase B expected in October 2009 (pending funding profile resolution)



Architecture

- *L-band radiometer for high accuracy*
- *L-band radar for high resolution; freeze-thaw detect*
- *Common 6m antenna spins at 15 rpm to provide global coverage every 3 days*
- *Merged radiometer & radar data yield high accuracy, high resolution soil moisture product*
- *680 km polar sun-synchronous orbit*
- *3 year mission life*

Mission Implementation Challenges

- *L-band measurements in increasingly congested terrestrial RFI environment*
- *Dynamics and control of 6 m spinning antenna*
- *Resolution of NASA funding profile for mission*

<http://smap.jpl.nasa.gov/>

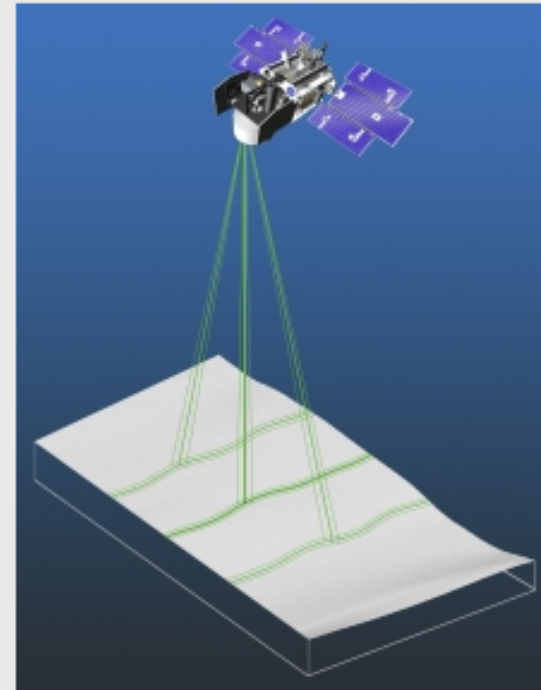
ICESat-2

ICESat-2

The Ice, Cloud, and land Elevation Satellite-2 (ICESat-2) is the 2nd-generation of the orbiting laser altimeter ICESat scheduled for launch in late 2015.

Science Objectives

- Quantifying polar ice-sheet contributions to current and recent sea-level change and the linkages to climate conditions.
- Quantifying regional signatures of ice-sheet changes to assess mechanisms driving those changes and improve predictive ice sheet models.
- Estimating sea-ice thickness to examine ice/ocean/atmosphere exchanges of energy, mass and moisture.
- Measuring vegetation canopy height as a basis for estimating large-scale biomass and biomass change.
- Enhancing the utility of other Earth observation systems through supporting measurements.



Design

In contrast to the ICESat design, ICESat-2 will use a micro-pulse multi-beam approach. This provides dense cross-track sampling to resolve surface slope on an orbit basis.

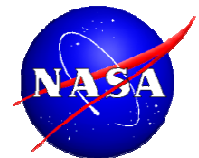
The sensor will have a high pulse repetition rate of 10 kHz (exact number still TBD) which generates dense along-track sampling of about 70 cm.

This concept has advantages over ICESat of improved elevation estimates over high slope areas and very rough (e.g. crevassed) areas and improved lead detection for sea ice freeboard estimates.

<http://icesat.gsfc.nasa.gov/icesat2/science.php>

ICESat II Standard Data Products

- ICESat-like products
 - Level 1 – ATLAS data converted to engineering units and calibrated for instrument prelaunch effects.
 - Level 1B – ATLAS global products processed with science calibrations and parameters.
 - Level 2 – ATLAS products with Geophysical parameters processed relative to surface type
 - Level 3 Ice sheet DEM and sea ice freeboard
- Considering New Level 3 global products for Atmosphere and Vegetation (carbon stocks)



Deformation, Ecosystem Structure and Dynamics of Ice (DESDynI)

The banner features a large background image of Earth from space, showing the Americas. A satellite is depicted in orbit above the satellite. A 3D visualization of a complex, multi-lobed pattern, likely representing ice deformation or a seismic hazard, is overlaid on the Earth's surface. The text 'DESDynI' is prominently displayed in a large, blue, serif font. Below it, the full name of the mission is written in a smaller, black, sans-serif font. A vertical navigation menu on the left side lists various sections of the website. To the right of the menu, there is a small inset photo of a building, followed by a descriptive paragraph about the mission and its objectives. At the bottom, two smaller photos are shown side-by-side: one of a lush green forest and another of a snowy mountain landscape.

DESDynI
Deformation, Ecosystem Structure
and Dynamics of Ice

- Home
- Mission Concept
- Science
- Applications
- Technology
- Societal Benefit
- Public Engagement
- Events
- Authorized Users Only

DESDynI:
A dedicated U.S. InSAR and LIDAR mission optimized for studying hazards and global environmental change.

Mission objectives:
Determine the likelihood of earthquakes, volcanic eruptions, and landslides.
Predict the response of ice sheets to climate change and impact on the sea level.
Characterize the effects of changing climate and land use on species habitats and carbon budget.
Monitor the migration of fluids associated with hydrocarbon production and groundwater resources.

NASA Contribution - Great SoCal Shakeout, Nov. 13, 2008



<http://desdyni.jpl.nasa.gov/>

DESDynI Mission Overview

Deformation, Ecosystem Structure and Dynamics of Ice (DESDynI)

DESDynI Mission Science

- *Earth Surface deformation for improving forecasts of seismic and volcanic events and other geohazards*
- *Ecosystem Structure for improving carbon budgets and models and characterizing species habitats*
- *Dynamics of Ice for improving understanding of changes in ice masses and climate*
- *DESDynI will provide the essential observations to understand and predict the impacts of climatic and tectonic forces upon our polar ice caps, sea ice, and mountain glaciers, upon our global ecosystems and our societal infrastructures. The DESDynI data is needed for scientific studies and operational needs.*

Objectives and Milestones

- *Antenna concept (reflector vs planar array) down-selection (Jan 2009)*
- *Lidar instrument design definition (Dec 2008)*
- *Team-X trade studies: radar+lidar single platform, radar-only platform and TanDEM-L (Jan 2009)*
- *Lidar-only platform design assessment (Jan 2009)*
- *Single vs Dual spacecraft down-selection (Mar 2009)*
- *Mission Concept Review (Feb. 2010)*

Deliverables

- *Application Workshop Report (Feb 2009)*
- *Team-X/IDL/MDL Reports (Mar 2009)*
- *MCR Project Documents (Jan 2010)*

DESDynI Mission Design

- *Two Spacecraft- Contemporaneous 3 - 5 year missions*
- *Multi-beam profiling Lidar Spacecraft*
 - *5-7 beam 25 meter foot print contiguous sampling*
 - *91 day repeat 393 Km dawn-dusk orbit*
 - *250-500m equatorial resolution after 5 yr.*
- *Fully-polarimetric L-band Radar Spacecraft*
 - *8 day near continuous land imaging*
 - *8 day repeat 761 Km dawn-dusk orbit*
- *Tandem-L InSAR partnership with DLR understudy*

Implementation Challenges

- *Integration observation strategies among three sets of disciplinary science requirements.*
- *flight/ground trades for orbit control of repeat-pass interferometry and for data rate/volume handling*
- *Assessment of alternate SAR techniques (ScanSAR vs. SweepSAR)*
- *Assessment of radar architecture using reflector with arrayed feed vs. planar phased array antenna*
- *Exploration of NASA mission cost reduction with foreign partners*
- *Data System for up to 2,4 Gbps peak acquisition rate*

DESDynI Science Requirements

Science Requirement	Measurement Requirement	Instrument Requirement
Ecosystem Structure <ul style="list-style-type: none"> • Global Biomass/Carbon • Global Biomass Change • Global Biodiversity 	<ul style="list-style-type: none"> • Canopy height and structure metrics accurate to 1 m accuracy (0° slope) at 250-500 m spatial resolution in 5 yrs • Biomass at 100 m spatial resolution in low biomass areas • Forest change maps, annually 	<ul style="list-style-type: none"> • 5-beam profiling lidar operated at near nadir incidence, 25 m profile resolution, • Lidar 91-day repeat orbit • Quad-pol L-band radar operating in $30\text{-}40^\circ$ incidence angles at 10 m resolution,
Dynamics of Ice <ul style="list-style-type: none"> • Ice sheet dynamics • Glacier dynamics • Sea ice dynamics 	<ul style="list-style-type: none"> • 2-D velocity accurate to 1 m/yr at 100 -500 m spatial resolution over ice sheets and glaciers, 5 yrs • DEM topography accurate to 1 m at 1 km spatial resolution over ice sheets and glaciers • Elevation precise to 3 cm at 25 m profile resolution over sea ice 	<ul style="list-style-type: none"> • 5-beam profiling lidar operated at near nadir incidence, 25 m profile resolution • Lidar 91-day repeat orbit • L-band radar operating in 8-day repeat period orbit, global accessibility, at 10 m resolution, continuously over
Deformation <ul style="list-style-type: none"> • Tectonic processes • Magmatic processes • Sequestration, landslides, and aquifer change 	<ul style="list-style-type: none"> • 3-D velocity time series accurate to 1-5 mm/yr at 10-100 m spatial resolution over active areas, 5 yrs 	<ul style="list-style-type: none"> • L-band radar operating in 8-day sampling period orbit • Global accessibility • 10 m resolution • All continuously over mission



Hyperspectral Infrared Imager (HyspIRI)



The screenshot shows the HyspIRI Mission Study Website. The header features the title "HyspIRI Mission Study" in blue text against a background of a satellite view of Earth. Below the header is a navigation bar with links: Home, Events, Science, Science Study Group, Documents, and Related Links. A "NASA/JPL" logo is visible on the right side of the navigation bar. Below the navigation bar, a "You are here: Home" breadcrumb is shown. The main content area is divided into two columns. The left column contains a "Navigation" sidebar with a tree view of the site's structure: Home (selected), Events, Science, Science Study Group, Documents, and Related Links. Below the sidebar is a calendar for August 2010, with the date "5" highlighted in orange. The right column contains the main text area, which starts with a "Welcome to HYSPIRI Mission Study Website" heading. The text describes the mission's instruments (VSWIR and TIR) and their capabilities. It also mentions the mission's focus areas (Carbon Cycle and Ecosystem and Earth Surface and Interior) and its recommendation by the National Research Council Decadal Survey. Below the text, there are three links: "Click to find out more information about the 2010 workshop and sign up", "Click to view 2009 Workshop Agenda and Presentations", and "Click to view 2009 HyspIRI Workshop Report".

HyspIRI Mission Study

Home Events Science Science Study Group Documents Related Links NASA/JPL

You are here: Home

Welcome to HYSPIRI Mission Study Website

The HyspIRI mission includes two instruments mounted on a satellite in Low Earth Orbit. There is an imaging spectrometer measuring from the visible to short wave infrared (VSWIR) and a multispectral thermal infrared (TIR) imager. The VSWIR and TIR instruments will both have a spatial resolution of 60 m at nadir. The VSWIR will have a temporal revisit of approximately 3 weeks and the TIR will have a temporal revisit of approximately 1 week. These data will be used for a wide variety of studies primarily in the Carbon Cycle and Ecosystem and Earth Surface and Interior focus areas. The mission was recommended in the recent National Research Council Decadal Survey requested by NASA, NOAA, and USGS.

The mission is currently at the study stage and this website is being provided as a focal point for information on the mission and to keep the community informed on the mission activities.

[Click to find out more information about the 2010 workshop and sign up](#)

[Click to view 2009 Workshop Agenda and Presentations](#)

[Click to view 2009 HyspIRI Workshop Report](#)



HyspIRI NASA Decadal Survey Mission

Science

This mission provides global surface **reflectance**, surface **temperature** and surface **emissivity** at high spectral, spatial and temporal resolutions.

These data will be used to produce the [first ever global measurements of ecosystem function and composition](#). Ecosystem function and composition are two of the three fundamental measurements which together with ecosystem structure are required to understand terrestrial and coastal ecosystems.

The data will also be used to address key science questions related to [volcanoes and wildfires](#), [water use and availability](#), [urbanization and land surface composition and change](#).

Architecture/Structure

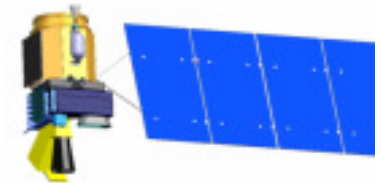
3-year mission, 2 instruments on 1 spacecraft at ~626 km 11 am sun sync orbit: (1) Imaging Spectrometer (VSWIR), (2) Thermal Infrared Multi-Spectral Imager (TIR)

VSWIR Science Measurement:

- 380 to 2500 nm in 10nm bands
- 60 m spatial resolution, 19 day revisit
- Global land and shallow water(<50m)
- Open ocean averaged to 1 km

TIR Science Measurement:

- 8 Bands (7 bands between 7.5-12 μm & 1 band at 4 μm)
- 60 m spatial resolution, 5 day revisit
- Global land and shallow water
- Day and night imaging

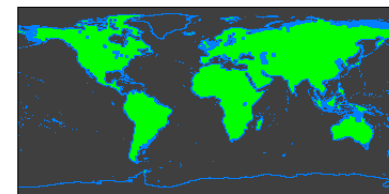


Status

- HyspIRI 1st Workshop report and whitepaper with science traceability and baseline architecture
- 2nd HyspIRI Workshop, August 11-13, 2009, Pasadena, CA
- Draft HyspIRI Level 1 requirements (baseline and minimal)
- Mission implementation schedule
- Discuss and list potential Level 2 and 3 products—workshop
- Consider partnership opportunities—workshop
- Ready for Mission Concept Review, Dec 2009

Mission Implementation Challenges


- HyspIRI is a high data rate mission. 740 Mbps dual polarization X-band downlink infrastructure needed at two polar ground stations.
- Data distribution and processing system for high volume products
- Flat funding for Tier 2 missions; waiting our turn



Geostationary Coastal and Air Pollution Events (GEO-CAPE)

 NATIONAL AERONAUTICS
AND SPACE ADMINISTRATION

FIND IT @ NASA :
 + GO



GEO-CAPE

HomeMissionScienceInstrumentsApplicationsDocumentsEventsTeam

Mission

Geostationary Coastal and Air Pollution Events (GEO-CAPE)

Launch: 2013 - 2016 Mission size: Medium

Objectives	Outcomes
 <p>Identification of human versus natural sources of aerosols and ozone precursors</p>	 <p>Prediction of track of oil spills, fires and releases from natural disasters</p>
 <p>Dynamics of coastal ecosystems, river plumes and tidal fronts</p>	 <p>Detection and tracking of waterborne hazardous materials Coastal health</p>
 <p>Observation of air pollution transport in North, Central and South America</p>	 <p>Forecasts of air quality</p>

<http://geo-cape.larc.nasa.gov/index.html>

Glory

Glory will Increase Our Understanding of the Earth's Energy Balance

The science objectives of the Glory mission include:

- The determination of the global distribution, microphysical properties, and chemical composition of natural and anthropogenic aerosols and clouds with accuracy and coverage sufficient for a reliable quantification of the aerosol direct and indirect effects on climate
- The continued measurement of the total solar irradiance to determine the Sun's direct and indirect effect on the Earth's climate.



Details

- + Launch Date: NET November 22, 2010
- + Launch Site: Vandenberg AFB, California
- + Vehicle: Taurus XL

Orbit

- + Altitude: 705km
- + Inclination: 98.2 degrees
- + Circular, Sun-synchronous (A-Train)

Design Life

- + 3 years; 5 year goal

(<http://glory.gsfc.nasa.gov/science.html>)

Surface Water Ocean Topography (SWOT)

SWOT : Surface Water Ocean Topography

About

Mission objectives:

- + SWOT will combine the concepts of WaTER (Water and Terrestrial Elevation Recovery) and the Hydrosphere Mapper missions into a single one to address the objectives of both land hydrology and oceanography.

Orbit: LEO, SSO

Instruments: Ka-band wide swath radar
C-band radar

Documents


SWOT Technology Investments
> [Overview \(.pdf\)](#)

Decadal Survey Symposium
> [Go to Workshop | SWOT Overview \(.pdf\)](#)

Related Links

> [SWOT at JPL](#)
> [SWOT at OSU](#)

SWOT : Surface Water Ocean Topography



The SWOT Satellite Mission and its wide-swath altimetry technology is a means of completely covering the world's oceans and freshwater bodies with repeated elevation measurements.

ICESat II | CLARREO | SMAP | DESDynI | SWOT | HypSIRI | ASCENDS
GEO-CAPE | ACE | LIST | PATH | GRACE-II | SCLP | GACM | 3D-Winds

<http://decadal.gsfc.nasa.gov/swot.html>

Climate Absolute Radiance and Refractivity Observatory (CLARREO)



<http://clarreo.larc.nasa.gov/index.php>

CLARREO Science Data Products

Level	Description
0	Raw instrument data
1B	Geolocated emitted spectral infrared radiance, reflected solar spectral radiance and nadir reflectance, GNSS-RO time delays, complete calibration and verification data records
2	GNSS-RO refractivity, temperature, and geopotential height profiles; cloud mask
3	Decadal change space & time averaged benchmarking products (global, 10° latitudinal zones, 30° by 30° regions, seasonal and annual)
4	Reference Inter-Calibration infrared and reflected solar products (monthly) <ul style="list-style-type: none">- IR[#] calibration of CrIS/IASI/AIRS*/CERES- RS calibration of CERES/VIIRS/AVHRR/MODIS*/Landsat/geo imagers

** MODIS and AIRS are on Terra, Aqua only: may not overlap with CLARREO mission;
the remaining sensors are all planned for missions in the CLARREO time period*

For IR, CLARREO calibrates CrIS, IASI which in turn calibrate leo and geo imager infrared channels.

Lidar Surface Topography (LIST)

LIST

> Introduction

LIST : Lidar Surface Topography

About

Mission objectives:

- + Land surface topography for hazards and water runoff

Orbit: LEO, SSO

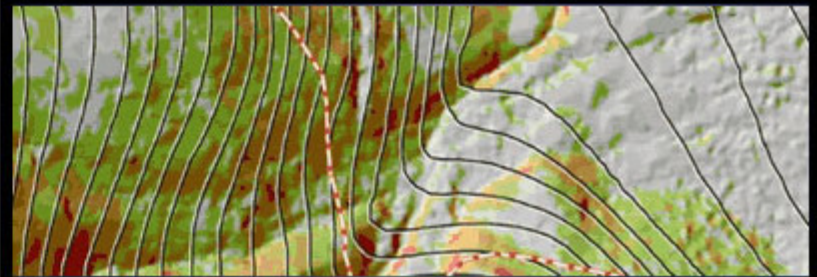
Instruments: Laser altimeter

Documents

Decadal Survey Symposium

> [Go to Workshop](#)

LIST : Lidar Surface Topography



This global set of data will serve users and researchers from a wide array of disciplines that need elevation and terrain information.

ICESat II | CLARREO | SMAP | DESDynI | SWOT | HyspIRI | ASCENDS
GEO-CAPE | ACE | LIST | PATH | GRACE-II | SCLP | GACM | 3D-Winds

Sentinels

**esa**
observing the earth

European Space Agency

ESA GMES Observing the Earth

05-Aug-2010

About GMES...
GMES Space Component...
ESA's Sentinel satellites
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GMES Sentinels



Sentinels overview

Based on over 30 years of experience developing and implementing Earth observation satellites, ESA is developing five new missions called Sentinels specifically for the operational needs of the joint European Commission-ESA GMES programme.

Sentinel-3

The Sentinels will not replace nor duplicate satellites that are planned as national initiatives, but will rather complement these capacities.

Each Sentinel mission is based on a constellation of two satellites to fulfil revisit and coverage requirements to provide robust datasets for GMES Services.

- Sentinel-1 is a polar-orbiting, all-weather, day-and-night radar imaging mission for GMES land and ocean services. The first Sentinel-1 satellite is planned for launch at the end of 2011.
- Sentinel-2 is a polar-orbiting, multispectral high-resolution imaging mission for GMES land monitoring to provide, for example, imagery of vegetation, soil and water cover, inland waterways and coastal areas. Sentinel-2 will also provide information for emergency services. The first Sentinel-2 satellite is planned for launch at the end of 2012.
- Sentinel-3 is a multi-instrument mission to determine parameters such as sea-surface topography, sea- and land-surface temperature, ocean colour and land colour with high-end accuracy and reliability. The first Sentinel-3 satellite is planned for launch in 2013.

Data access

- GMES Space Component Data Access

Related links

- European Commission GMES site

Announcements of Opportunity

- Mission Advisory Group Applications

http://www.esa.int/esaLP/SEM097EH1TF_LPgmes_0.html

Sentinels

ESA's Sentinel satellites



Sentinel-2

Sentinel-2 polar-orbiting satellites will provide systematic global acquisitions of high-resolution multispectral imagery with a high revisit frequency. This mission is tailored towards the needs of operational land monitoring and emergency services.

- **Sentinel-1 is a polar-orbiting, all-weather, day-and-night radar imaging mission for GMES land and ocean services. The first Sentinel-1 satellite is planned for launch at the end of 2011.**
- **Sentinel-2 is a polar-orbiting, multispectral high-resolution imaging mission for GMES land monitoring to provide, for example, imagery of vegetation, soil and water cover, inland waterways and coastal areas. Sentinel-2 will also provide information for emergency services. The first Sentinel-2 satellite is planned for launch at the end of 2012.**
- **Sentinel-3 is a multi-instrument mission to determine parameters such as sea-surface topography, sea- and land-surface temperature, ocean colour and land colour with high-end accuracy and reliability. The first Sentinel-3 satellite is planned for launch in 2013.**

Landsat-8 (Landsat Data Continuity Mission : LDCM)

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The Landsat Data Continuity Mission: Extending the Longest Legacy of Global Land Observation

Contributors: Laura Rocchio and Bill Ochs
Posted: October 25, 2007

In a world newly awash with geospatial information, only Landsat offers a rich archive of global mid-resolution, highly calibrated, multispectral data of Earth's landmasses. To extend this legacy, plans are in the works for a July 2011 launch of the Landsat Data Continuity Mission (LDCM), which will collect and archive data consistent with its predecessor Landsat satellites. This July, NASA selected Ball Aerospace and Technology Corporation to build LDCM's Operational Land Imager (OLI) instrument, bringing the long-awaited Landsat follow-on mission closer to actualization.



Design concept of LDCM's Operational Land Imager instrument. Image credit: Ball Aerospace & Technology Corp.

http://landsat.gsfc.nasa.gov/news/news-archive/sci_0017.html

